

14-07-1999

CLAIMS

1. A friction stir welding method according to which the workpieces (2,3) to be welded are positioned on a work-table (7) and by means of clamping means (5,6) clamped to one another and/or to the work-table and according to which a rotating welding means (12, 13) is arranged to move along a joint between the workpieces while being pressed against said workpieces during the welding, ~~characterised in that~~ ^{wherein} additional heat is supplied to the joint prior to and/or during the welding operation, in excess of the frictional heat generated in the joint from the rotation of the welding means (12, 13) and of any other heat that may be supplied to the joint in any other manner by the welding means (12, 13).

2. A method as claimed in claim 1, ~~characterised by~~ ^{wherein} pre-heating the joint to a maximum of 250°C below the fusion temperature of the material of the joint.

3. A method as claimed in claim 1, ~~or 2, characterised in that~~ ^{wherein} the joint is heated by a heating element positioned underneath the joint.

4. A method as claimed in ~~any one of the preceding claims~~ ³ ~~characterised in that~~ ^{wherein} the joint is supported by a subjacent backing means (7b) which is pre-heated to a temperature in excess of 100°C.

5. A method as claimed in claim 4, ~~characterised in that~~ ^{wherein} the backing means is heated to a temperature in the range of 150-250°C.

6. A method as claimed in claim 4, ~~characterised in that~~ ^{wherein} the backing means is heated to a temperature in the range of 500-1000°C.

7. A method as claimed in claims ~~4, 5 or 6,~~ ^{wherein} ~~characterised in that~~ the backing means (7b) is heated by a heating coil (70) built into backing means.

8. An apparatus (1) for friction stir welding, comprising a work-table (7) supporting the workpieces (2,3) to be welded, at least one clamping means (5,6) for clamping the workpieces to one another and/or to the work-table, and a welding means (12, 13) adapted to be advanced along a joint between the workpieces while being pressed against said workpieces during the welding, ~~characterised by~~ ^{wherein} a heating element (70) for supply of additional heat to the joint prior to and/or during the welding operation, in excess of the frictional heat generated in the joint from the rotation of the welding means (12, 13) and of any other heat that may be supplied to the joint in any other manner by the welding means (12, 13).

9. An apparatus as claimed in claim 8, ~~characterised in that~~ ^{wherein} it comprises a heating element positioned underneath the joint.

10. An apparatus as claimed in claim 8 or 9, ~~characterised by~~ ^{wherein} a backing means (7b) positioned underneath the joint.

11. An apparatus as claimed in claim 10, ~~characterised in that~~ ^{wherein} the backing means (7b) is adapted to be heated by the heating element (70).

12. An apparatus as claimed in claim 11, ~~characterised in that~~ ^{wherein} the heating element is a heating coil (70) built into the backing means (7b).